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Notes on the genus *Plegadiphilus* (Phthiraptera: Menoponidae) with description of a new species

by

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A new species of *Plegadiphilus* is described from *Geronticus eremita* (Aves: Threskiornithidae). The male genitalia bear a resemblance to those of *Eucolpocephalum*, and this is taken as further evidence that the two genera evolved from a common ancestor. The six known species of *Plegadiphilus* are tentatively assigned to three species-groups on the basis of the head chaetotaxy and the structure of the male genitalia. Comments are made on the identity of *Plegadiphilus mamillatus* and on the nymphal abdominal tergal setae in *Plegadiphilus*.

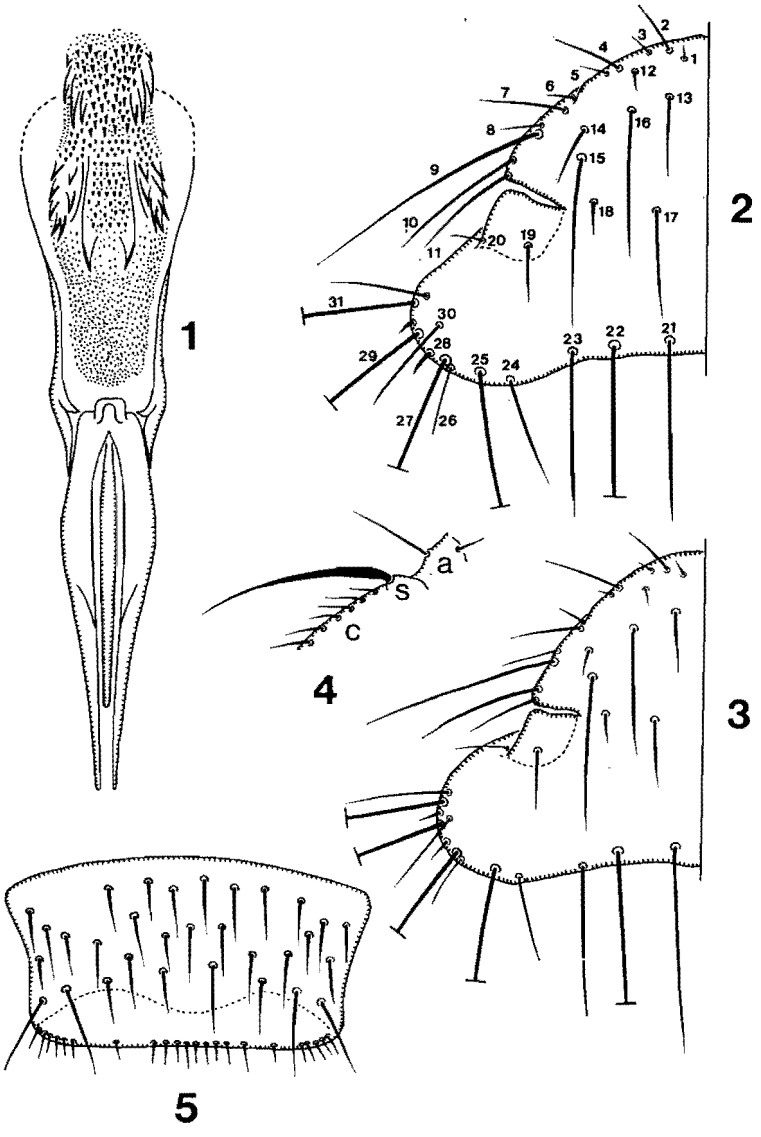
INTRODUCTION

The main object of this preliminary review of the Phthirapteran genus *Plegadiphilus* Bedford, 1939 (Amblycera: Menoponidae) is to group together the species that seem to be closely related.

The first named species belonging to the genus is *Menopon mamillatum* Piaget, 1885, allegedly from *Theristicus caudatus* (Boddaert). Bedford (1939) established the genus *Plegadiphilus*, type-species *P. threskiornis* Bedford, 1939 from *Threskiornis aethiopicus* (Latham). Bedford noted that *Menopon mamillatum* belonged in his new genus; he could not have had access to the description of *Menopon plegadis* Dubinin, 1938 from *Plegadis falcinellus* (L.), for he died on 28 January 1938 (Munro, 1939). Clay & Hopkins (1952) included three species (*mamillatus*, *plegadis* & *threskiornis*) in *Plegadiphilus*. The recent description of *P. eudocimus* Tuff, 1965 from *Eudocimus albus* (L.) and *P. cayennensis* Emerson & Price, 1969 from *Mesembrinibis cayennensis* (Gmelin) brings to 5 the number of species described in this genus. Emerson & Price (1969) provided a key to the species.

1. The *plegadis* species-group

I include the following species in this group: *P. plegadis*, *P. eudocimus* and *P. cayennensis*. All three share the same type of male genitalia, with long tapering parameres enclosing a narrow endomeral structure which may best be referred to as a pseudopenis. The parameres articulate with a basal apodeme which is in the form of a flattened transparent plate bordered proximally with lateral sclerites, lying between which is a genital sac with pointed sclerites and numerous denticles of various sizes. The genitalia of *P. plegadis* are illustrated in fig. 1; those of *P. eudocimus* are virtually identical, with some differences in the sclerites. I have not seen specimens of *P. cayennensis*, but Emerson



Figs 1–5. 1. Male genitalia, *Plegadiphilus plegadis*. 2. Dorsal head chaetotaxy, *P. plegadis*. 3. Dorsal head chaetotaxy, *P. eudocimus*. 4. Subocular setal group, *P. plegadis*. 5. Female subgenital plate, *P. plegadis*. (a = anterior subocular seta; c = subocular comb row; s = subocular seta).

& Price (1969) provide good illustrations. In all three species the parameres are often distorted during mounting and may appear to be strongly curved; this is the case in the specimen depicted by Emerson & Price.

The dorsal head chaetotaxy of *P. plegadis* is illustrated in fig. 2, that of *P. eudocimus* in fig. 3; the figures of Emerson & Price (1969) indicate that the dorsal head chaetotaxy of *P. cayennensis* is essentially the same as in *P. eudocimus*. The three species share the following salient features: *dhs* 12 much shorter than 13; *dhs* 11 never minute, always at least ½ as long as 10, and both these setae always longer than *dhs* 8; 17 & 18 never minute, and 17 usually longer than 18; *dhs* 24 shorter and more slender than 25 (see Clay, 1969 for comments on the numbering of *dhs* 24; for convenience I regard the seta laterad to 23 as *dhs* 24, whether it is long or short). The subocular seta in the *plegadis* species-group is flattened and enlarged (fig. 4). *P. plegadis* is distinguished in the female by a number of good characters, the most obvious of which are the long posterior projections on pleurites II–VII, and the short, slender vulval marginal setae which are concentrated into central and lateral groups (fig. 5). In *eudocimus* and *cayennensis* there are posterior projections on pleurites II–VI only, the vulval marginal setae are longer and stouter and arranged in a continuous row; both species have been illustrated by their respective authors (Tuff, 1965; Emerson & Price, 1969); the latter list the characters used to separate *eudocimus* and *cayennensis*, which appear to be closely related.

2. The problem of *Plegadiphilus mamillatus* (Piaget)

Menopon mamillatum Piaget, 1885 is represented at the British Museum (Natural History), London by 4 female specimens, a lectotype and three paralectotypes; the lectotype series was designated by Clay (1949). The host record on the Piaget slides is given as *Theristicus caudatus*, without any indication of the source of the specimens. During a recent visit to London I was able to examine the type material of *P. mamillatus*, and as a result two assertions of Emerson & Price (1969) must be repudiated. The first is that *P. mamillatus* has posterior projections on pleurites II–VII, as in *p. plegadis*. This is not so; pleurites II–VI have clear posterior projections, but pleurite VII in all four specimens is without any trace of a projection. Second, in their key to *Plegadiphilus* species Emerson & Price (1969) distinguish *mamillatus* in couplet 2 by "Two rows of setae on metanotum". The Piaget specimens have a marginal row of 17–19 metanotal setae and (in common with other species of *Plegadiphilus*) 3+3 short anterior metanotal setae, but these latter cannot with any truth be said to be arranged in a row. The information used by Emerson & Price appears to date back to an erroneous statement by Piaget when he described *Menopon mamillatum* in 1885, and probably refers to the row of setae on the margin of abdominal tergite I; Bedford (1939) repeated Piaget's statement that there are two rows of setae on the metanotum.

In the absence of male specimens it is not possible to say with certainty to which of my proposed species-groups *P. mamillatus* should be assigned, but I am of the opinion that it belongs to the *plegadis* group and is related to *P. eudocimus* and *P. cayennensis*, more particularly the latter. The dorsal head chaetotaxy of the *mamillatus* specimens agrees with the typical pattern for the *plegadis* group, and fig. 3 serves very well as an illustration of the *mamillatus* dorsal head chaetotaxy. The subocular seta in *mamillatus* is also enlarged and flattened. In the key published by Emerson & Price (1969) the Piaget specimens (no posterior projections on pleurite VII) run down to *P. cayennensis* on the grounds of having one of the marginal pleural setae on III–VI

much longer than the others. I am not suggesting that *mamillatus* is an earlier name for *cayennensis*, and my notes on the Piaget types indicate that there are probably sufficient differences between females of the two species to allow adequate separation. What does seem necessary is to stress that *P. mamillatus* is not a distinctive species with pleural projections on VII and two rows of setae on the metanotum, and workers on this genus should exercise restraint when dealing with suspected new species in the *plegadis* group.

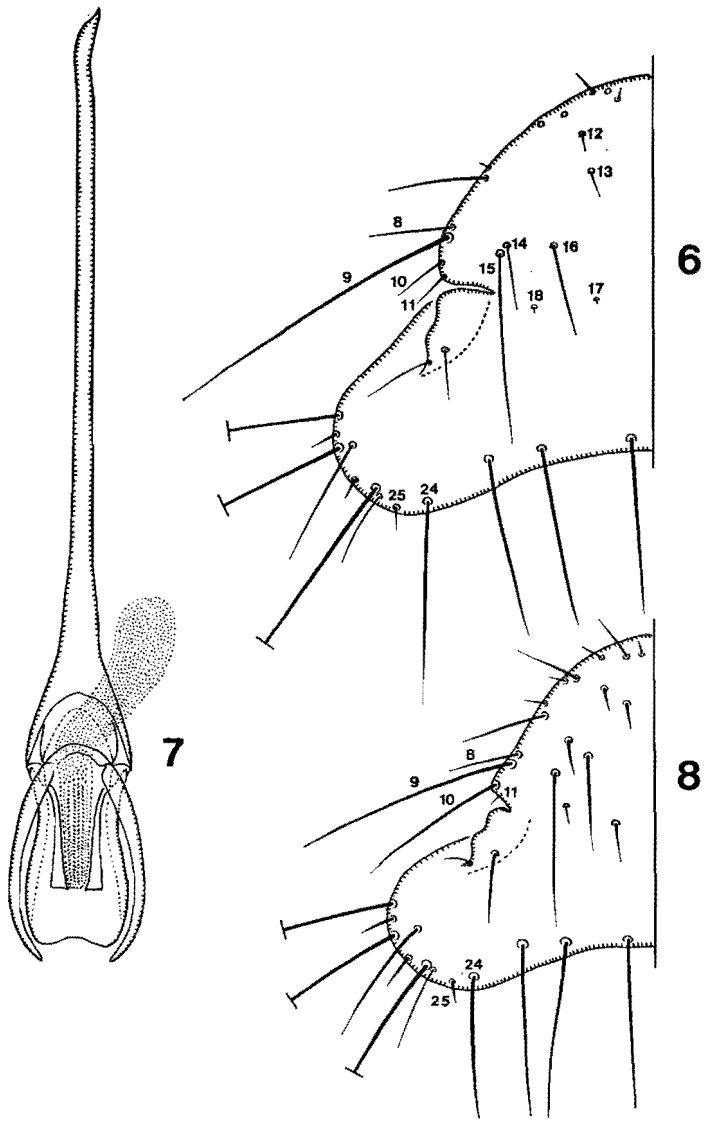
I have examined two slides bearing material collected from *Theristicus caudatus* by M. A. Carriker, Jr. The first, from Chatarona, Bolivia, 22 September 1934 (no. 10167) bears two female specimens in poor condition which appear to be conspecific with the Piaget types of *P. mamillatus*. The second slide, from Camperucho, Magdalena, Colombia, 1 July 1945 (no. 6487) has one female specimen of *Colpocephalum trispinum* (Piaget, 1885), a regular parasite of *T. caudatus* (Price & Beer, 1964), and one female *Plegadiphilus*. This specimen clearly belongs to an undescribed species, and will probably warrant the creation of a separate species-group when sufficient material becomes available for a full description. The dorsal head chaetotaxy is illustrated in fig. 6, the most important features being; *dhs* 10 & 11 both short, and both shorter than 8; alveoli of 14 & 15 almost contiguous; *dhs* 17 & 18 both minute; 24 long and stout, 25 short and fine. The subocular seta is not flattened and enlarged. There are posterior projections on II–VI, although those on VI are very small and indistinct.

It is apparent that the few specimens available from *Theristicus caudatus* present a confusing picture, perhaps due to the ocurrence of two *Plegadiphilus* species on this host, or errors in the host data due to incorrect labelling of slides, misidentifications of birds or contamination of samples. Priorities for future research include the collection of further material from *T. caudatus* to confirm whether this is the true host of *P. mamillatus*, and careful comparison of *Plegadiphilus* from other ibises with the types of *P. mamillatus* before attempting to describe new species in the *plegadis* species-group.

3. The *threskiornis* species-group

At present the sole representative of this proposed group is *P. threskiornis* Bedford, 1939 from *Threskiornis aethiopicus*. The male genitalia are illustrated in fig. 7. There is a very long and narrow basal apodeme, expanded caudally, articulating with which is a pair of curved paramers united at their bases by a transverse bridge. The parameres enclose a lobe-like endomeral piece, indented medially. Overlying the endomeral piece are a pair of sclerotic bands which support the distal part of the genital sac; the latter has fine reticulation, but lacks large denticles or any form of distinctive sclerite. The dorsal surface of the head is depicted in fig. 8. The preocular margin has a notch rather than a narrow slit and ocular nodi are well developed; *dhs* 10 long and stout, 11 very short and slender; 18 very short to minute; 24 long and stout, 25 short. The subocular seta is enlarged and flattened, as in the *plegadis* group. Posterior projections normally occur on pleurites II–V in the male, but in the female there is often at least a slight projection on VI, sometimes present on one side only.

I have seen representatives of the *threskiornis* group from several ibises (listed below), and a detailed study of this material will be carried out in due course. The specimens from the different hosts are very similar; several closely related species may be involved, or the different populations may eventually be regarded as *P. threskiornis sens. lat.* Material is available from *Threskiornis aethiopicus*, *T. melanocephalus* (Latham), *T. molucca* (Cuvier), *T. spinicollis* (Jameson) and *Hagedashia hagedash* (Latham).



Figs 6–8. 6. Dorsal head chaetotaxy, *Plegadiphilus sp.* from *Theristicus caudatus*. 7. Male genitalia, *P. threskiornis*. 8. Dorsal head chaetotaxy, *P. threskiornis*.

4. The *geronticus* species-group

This group is created for the new species described below, which seems to differ sufficiently from all known *Plegadiphilus* to warrant such action. In the description

that follows, all measurements (made with an ocular micrometer) are given in millimetres. A value in parenthesis following a statement of range represents the mean (means of setal counts are corrected to the nearest whole number). All quantitative data are based on a sample of 10 specimens of each sex. The terminology used agrees with that of Clay (1969) as closely as possible.

Plegadiphilus geronticus spec. nov., figs 9–12

Type-host: *Geronticus eremita* (Linnaeus)

HOST DISTRIBUTION. Formerly a breeding species in Europe, now extinct in this region and confined to two widely separated breeding populations in North Africa (Algeria and Morocco) and Asia Minor (Birecik, Turkey and perhaps Syria). Migration and winter range not well known, but wintering birds, suspected to be from Asia Minor, are found in north-east Africa. The north-west African breeding population is thought to have winter quarters somewhere on the southern edge of the Sahara (Smith, 1970).

FEMALE. General appearance and chaetotaxy as in fig. 9. Dorsal head chaetotaxy as in fig. 10. Important features: *dhs* 12 much longer than 13, usually reaching well beyond alveolus of 16; 17 usually shorter than 18; 24 long and stout, 25 very short. Preocular margin with narrow slit; ocular nodi well-developed; subocular seta not enlarged and flattened.

Thorax with 2 pairs of dorsal pronotal setae lying just behind the line of the transverse carina, the inner pair minute. Vertical prothoracic carina well-developed; 9 marginal pronotal setae each side; 2 short median prosternal setae. Postnotum slender and elongated, mesonotum with 4 anterior, 1+1 marginal setae, all minute. Mesosternal plate setae 11–15 (13), metasternal plate setae 10–16 (13). Laterally each side of both meso- and metasternal plates a group of 3–4 stout setae on a sclerotic ridge. Metanotum with 3+3 short anterior setae, 21–27 (25) marginal setae; metathoracic pleurites with 1 long, 1–3 short stout setae. Femoral brushes on III with 19–27 (24) setae.

Abdomen. Tergite I with 27–31 (29) marginal setae, the most lateral but one (the postspiracular) being long and stout.

Postspiraculars. Very long on II–VIII; the associated inner seta fairly short and stout on II–VI, slightly longer and more slender on VII & VIII. On II there is an additional seta between the postspiracular and the (non-functional) spiracle; in a few specimens this seta is absent on one or both sides (see Clay, 1970 for comments on this seta, which is derived from the lateral abdominal plate during nymphal development).

Tergocentrals. Long setae alternating with medium setae on II–VI, long setae alternating with short slender setae on VII & VIII. Range: II, 27–34 (29); III, 30–34 (32); IV, 30–37 (33); V, 29–36 (33); VI, 29–37 (33); VII, 29–35 (32); VIII, 23–27 (25). Terminal segment with 17–23 marginal setae extending in a line from the dorsal surface laterally and ventrally; of these 1 dorsal pair medium, 1 lateroventral pair each side long and stout, the remainder short and slender.

Anterior tergal setae. The usual short pair laterally on I & II. Additionally, medium anterior tergal setae often occur on II–VII, although some specimens lack anterior setae on all these segments. Observed range: II, 0–3 (1); III, 0–7 (2); IV & V, 0–5 (2); VI, 0–3 (1); VII, 0–1 (0).

Pleurites. Distinct posterior projections on II–VI; on some specimens there is a very slight projection on VII. Setae on II–VIII are arranged in marginal (*m*) and

Fig. 9. *Plegadiphilus geronticus* spec. nov. Dorsal/ventral view of female.

anterior (*a*) series; one marginal seta on II–VIII longer than others. Setal range: I, 1 long, 1 or 2 short setae; II, 6–9 (7) *m*, 0–2 (1) *a*; III, 8–9 (9) *m*, 5–10 (7) *a*; IV, 7–10 (9) *m*, 7–14 (10) *a*; V, 7–10 (9) *m*, 9–15 (11) *a*; VI, 8–9 (9) *m*, 9–17 (11) *a*; VII, 6–10 (7) *m*, 7–13 (10) *a*; VIII, 3–6 (4) *m*, 3–7 (6) *a*.

Sternal chaetotaxy. Sternite I narrow, lying between hind coxae, with 2–4 (3) setae. Sternites II–VII with dense, rather variable chaetotaxy. No definite brushes of setae, but on III–VI there is some slight aggregation of the lateral setae. Sternite VIII more or less fused with succeeding sternites to form a subgenital plate; setal counts given for VIII below include all setae except the vulval marginal setae, which are slender and lie between a stout lateral seta each side of the vulval margin. Range: II, 43–56; III, 62–87; IV, 79–112; V, 88–120; VI, 78–105; VII, 69–97; VIII, 34–54. Vulval marginal setae 18–29 (22).

MALE. General appearance and chaetotaxy close to female, slightly smaller in size. Mesosternal plate setae 12–16 (13); metasternal plate setae 10–14 (12); metanotal marginal setae 20–23 (22); femora III with ventral brushes of 19–25 (22) setae.

Abdomen. Terminal segments as in fig. 11. Tergite I with 26–29 (28) marginal setae. Postspiraculars, inner setae, shape and chaetotaxy of pleurites essentially as for female.

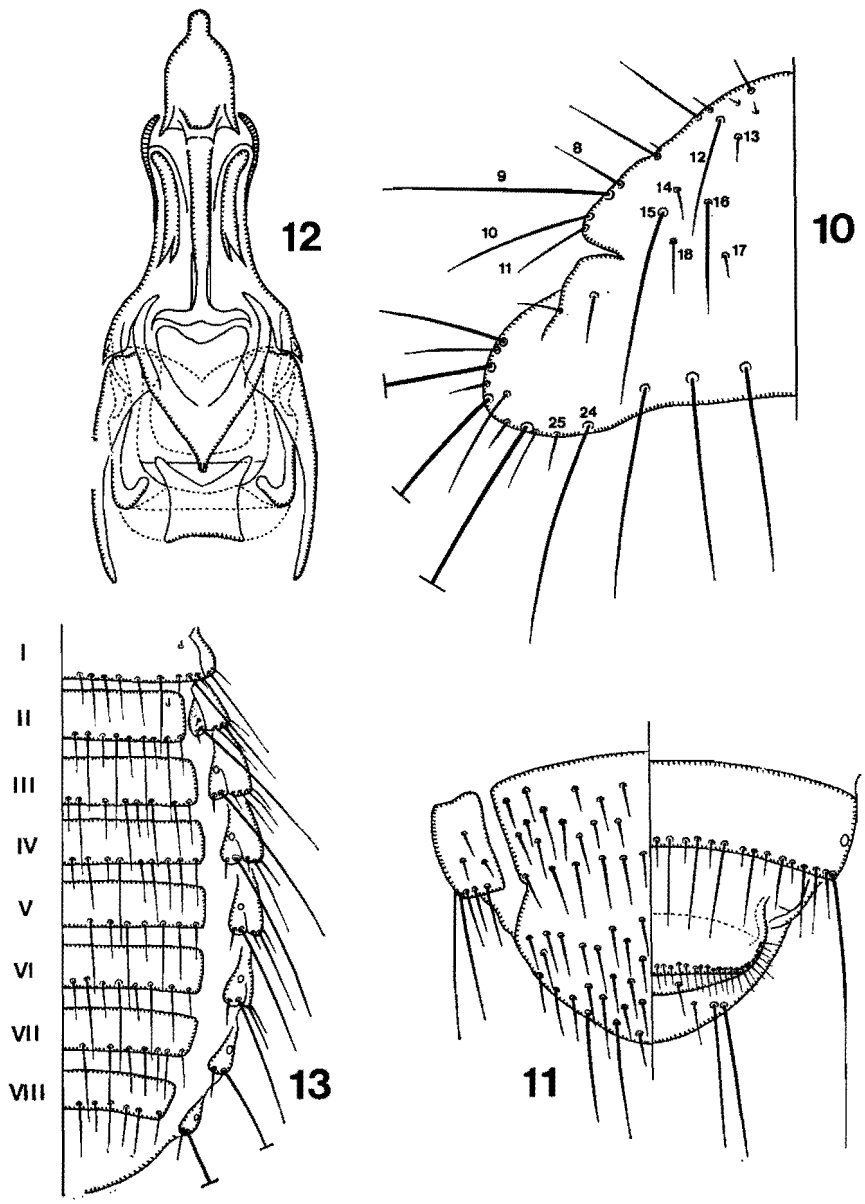
Tergocentrals. II, 28–32 (30); III, 29–34 (31); IV, 29–34 (32); V, 31–35 (33); VI, 30–36 (34); VII, 32–37 (35); VIII, 22–26 (24). Tergite IX rounded, with 29–37 (34) fine marginal setae; terminal tergite with 8–12 setae, of which 2+2 laterally usually long and stout. Anterior tergal setae lacking on the majority of specimens; a few individuals have up to 2 on V and 3 on VII.

Sternal chaetotaxy. Stained material indicates that sternite VIII is fused with the terminal sternites to form a subgenital plate; the limits of VIII are marked by a row of setae, and setal counts given below for VIII refer to those on the anterior part of the subgenital plate. Range: I, 0–2; II, 38–52; III, 63–75; IV, 81–107; V, 88–107; VI, 74–96; VII, 67–81; VIII, 39–47. Terminal sternite with 28–47 setae, of which 2–4 marginal usually long and stout.

Genitalia. Structure complicated and difficult to illustrate and interpret satisfactorily. Fig. 12 is somewhat simplified, details of genital sac being omitted for clarity. Parameres tapering, slightly incurved, with large heads. Endomeral piece heart-shaped, the anterolateral corners overlying the parameral heads. Laterally the basal plate has sclerotic posterior extensions, recurved apically and supporting between them a rectangular membranous structure. Anteriorly the basal plate is short and broad with almost parallel sides; overlying the basal plate at its anterior extremity are a domed structure and paired lateral bands with posterior points, both apparently part of the genital sclerite and enclosed in a membranous sac with coarse reticulation, as well as denticles of various sizes.

DIMENSIONS.

	Female	*Male*
Preocular width . .	0·47–0·50 (0·49)	0·46–0·48 (0·47)
Temple width . .	0·68–0·73 (0·72)	0·68–0·71 (0·69)
Head length . . .	0·35–0·38 (0·36)	0·35–0·38 (0·36)
Total length . . .	2·8 –2·9 (2·8)	2·5 –2·7 (2·6)



Figs. 10–13. *Plegadiphilus geronticus* spec. nov. 10. Dorsal head chaetotaxy. 11. Male terminal abdominal segments, dorsal/ventral view. 12. Male genitalia. 13. Nymphal abdomen, dorsal view.

HOLOTYPE. ♂ ex *Geronticus eremita*, Damascus, Syria (xi. 1919. Meinertzhagen No. 1124).

PARATYPES. 15 ♂, 2 ♀, same data as holotype; 3 ♂, 10 ♀ ex *Geronticus eremita*, Aden (xii.1948. Meinertzhagen No. 17952).

All type material was received on loan from the British Museum (Natural History), London and returned to the same institution.

DISCUSSION. *Plegadiphilus geronticus* spec. nov. is the largest known species in the genus. The dorsal head chaetotaxy is distinctive, and the male genitalia are grossly different from those of any described species of *Plegadiphilus*.

In trying to shed some light on the affinities of *P. geronticus* I have been impressed by the resemblance of the male genitalia to those of *Eucolpocephalum femorale* (Piaget, 1885). Tuff (1966) has recently redescribed and illustrated *E. femorale*, which he records from three species of Plataleinae (*Platalea leucorodia* L., *P. alba* Scopoli and *Ajaia ajaja* (L.)) and one species of Threskiornithinae (*Phimosus berlepschi* Hellmayr); the latter record is based on 2 specimens only and may be erroneous; further collecting is necessary to confirm that *Eucolpocephalum* is not confined to Plataleinae, as has been previously thought. Both Tuff (1966) and Clay (1969) recognise that *Eucolpocephalum* and *Plegadiphilus* are closely related. The complex male genitalia of *Eucolpocephalum* are regarded as one of the diagnostic features of that genus by Tuff (1966), and to date no comparable structure has been recorded in a member of *Plegadiphilus*. I am of the opinion that the discovery of male genitalia in *P. geronticus* which bear a resemblance to those of *Eucolpocephalum* is further evidence that the two genera evolved from the same ancestral form which parasitized the predecessors of present-day ibises and spoonbills.

5. Abdominal chaetotaxy of nymph

Clay (1970) has discussed the relationship of the postspiracular setal complex, the spiracles and the tergal and lateral plates of the abdomen in the Amblycera; she described and illustrated the arrangement of the abdominal plates of the nymphal stages of *Eidmanniella* sp. (Menoponidae), which differs from the condition in the adult.

Included in the type material of *P. geronticus* is a single nymph, probably of the third instar, which provides confirmation of Clay's observations from another genus of Menoponidae. The dorsal abdominal surface of the specimen is illustrated in fig. 13. On segments II–VIII the postspiracular setal complex is borne on a sclerotic plate incompletely separated from the remainder of the lateral plate (*sensu* Clay, 1970) by a narrow suture extending posteriorly from the level of the spiracle. The lateral plates on II–VIII are clearly separated from their corresponding tergal plates by a membranous area. On segment I the situtation is different, with the region bearing the postspiracular complex completely fused to the tergal plate, and separated from the remaining "pleurite" by a narrow suture. During the moult to the adult stage the postspiracular complex on II–VIII likewise becomes joined to the tergal element, leaving the outer part of the lateral plate cut off by the suture as the "pleurite".

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REFERENCES

BEDFORD, G. A. H. 1939. Notes on Menoponidae (Mallophaga) with Descriptions of New Genera and Species. *Onderstepoort J. vet. Sci. Anim. Ind.* **12:** 121–152.

CLAY, T. 1949. Systematic Notes on the Piaget Collections of Mallophaga. Part II. *Ann. Mag. nat. Hist.* (12) **2:** 895–921.

———— 1969. A key to the genera of the Menoponidae (Amblycera: Mallophaga: Insecta). *Bull. Br. Mus. nat. Hist.* (*Ent.*) **24** (1): 3–26.

———— 1970. The Amblycera (Phthiraptera: Insecta). *Bull. Br. Mus. nat. Hist.* (*Ent.*) **25** (3): 75–98.

EMERSON, K. C. & R. D. PRICE. 1969. A new species of *Plegadiphilus* (Mallophaga: Menoponidae) from the Cayenne Ibis. *Fla Ent.* **52** (3): 161–163.

HOPKINS, G. H. E. & T. CLAY. 1952. A check list of the genera and species of Mallophaga. British Museum (Natural History), London. 362 pp.

MUNRO, H. K. 1939. Obituary, G. A. H. Bedford. *J. ent. Soc. sth. Afr.* **1:** 149–150.

PRICE, R. D. & J. R. BEER. 1964. The *Colpocephalum* (Mallophaga: Menoponidae) of the Ciconiiformes. *Ann. ent. Soc. Am.* **58** (1): 111–131.

SMITH, K. D. 1970. The Waldrapp *Geronticus eremita* (L.). *Bull. Br. Orn. Club* **90** (1): 18–24.

TUFF, D. W. 1965. A new species of *Plegadiphilus* (Mallophaga: Menoponidae). *J. Kans. ent. Soc.* **38:** 233–235.

———— 1966. Notes on *Eucolpocephalum femorale* (Mallophaga: Menoponidae). *J. Kans. ent. Soc.* **39:** 379–382.

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